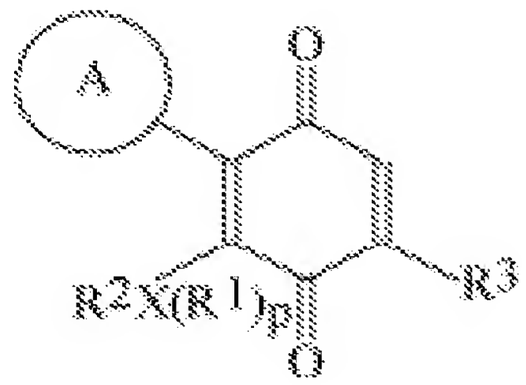
Claims for US:

1. A pharmaceutical composition comprising as active agent a cannabinoic quinone or an enantiomer thereof, wherein said cannabinoic quinone is a compound of the general formula (I):



(I)

O

wherein,

ring A is 5-, 6-, or 7-membered alicyclic or aromatic ring optionally substituted with from 1 to 3 substituents independently selected from optionally branched C_1-C_8 alkyl, optionally branched C_1-C_8 alkenyl, hydroxy, alkoxy, halo (fluoro, chloro, bromo, iodo), thio, amino and cyano;

X is an oxygen, nitrogen or sulfur atom;

p is zero when X is oxygen or sulfur, or p is 1 when X is nitrogen;

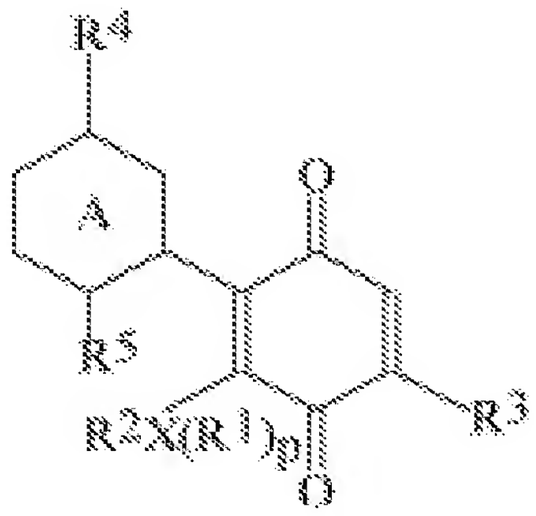
R^1 is H or C_1-C_8 alkyl;

R^2 designates a substituent selected from H and C_1-C_8 alkyl, or R^2 designates an optionally branched C_1-C_8 alkylene connected to ring A forming a 6-membered heterocyclic ring comprising atom X, two carbon atoms of the quinone ring to which X is attached and carbon atoms 3 and 4 of ring A;

R^3 is optionally branched C_1-C_{16} alkyl or optionally branched C_1-C_{16} alkenyl, wherein said alkyl or alkenyl are optionally substituted with hydroxyl, alkoxy, halo (fluoro, chloro, bromo, iodo), thio, amino or cyano;

and optionally further comprising at least one pharmaceutically acceptable additive, diluent and/or carrier.

2. The pharmaceutical composition of claim 1, wherein said cannabinoic quinone is the compound of formula (II):



(II)

wherein

ring A is a cyclohexane, cyclohexene or benzene ring;

X is an oxygen, nitrogen or sulfur atom;

p is zero when X is oxygen or sulfur, or p is 1 when X is nitrogen;

R^1 is H or C_1-C_8 alkyl;

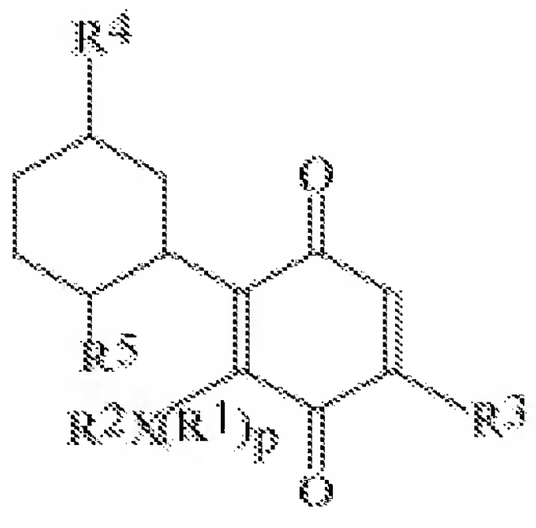
R^2 designates a substituent selected from H and C_1-C_8 alkyl, or R^2 designates an optionally branched C_1-C_8 alkylene connected to ring A forming a 6-membered heterocyclic ring comprising atom X, two carbon atoms of the quinone ring to which X is attached and carbon atoms 3 and 4 of ring A;

R^3 is optionally branched C_1-C_{18} alkyl or optionally branched C_1-C_{18} alkenyl, wherein said alkyl or alkenyl are optionally substituted with hydroxyl, alkoxy, halo (fluoro, chloro, bromo, iodo), thio, amino or cyano;

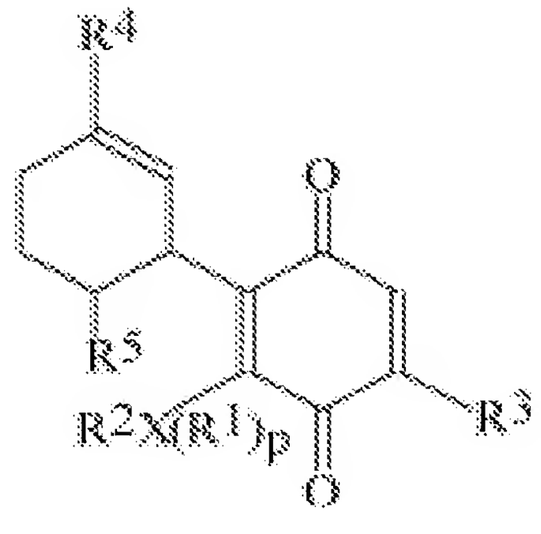
R^4 is optionally branched C_1-C_8 alkyl or optionally branched C_1-C_8 alkenyl, optionally substituted with hydroxyl, halo (fluoro, chloro, bromo, iodo) thio, amino and cyano; and

R^5 is optionally branched C_1-C_8 alkyl or optionally branched C_1-C_8 alkenyl, or R^5 is hydrogen when R^2 is alkylene.

3. The pharmaceutical composition of claim 1, wherein said cannabinoic quinone is a compound of one of formulae (III) or (IV), wherein formulae (III) and (IV) have the structure:



(III)



(IV)

wherein

X is an oxygen, nitrogen or sulfur atom;

p is zero when X is oxygen or sulfur, or p is 1 when X is nitrogen;

R^1 is H or C_1-C_8 alkyl;

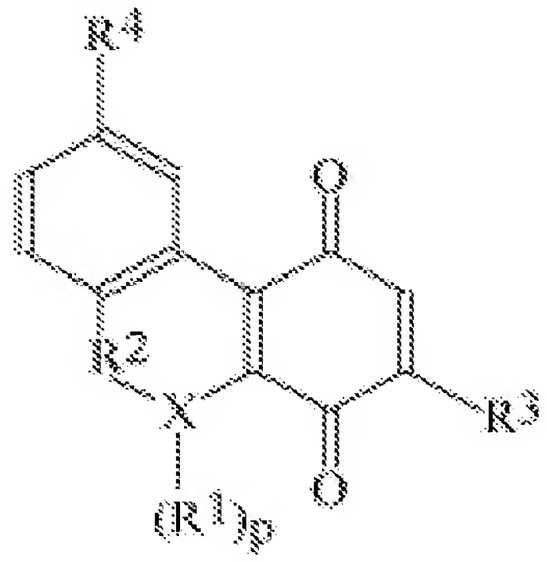
R^2 designates a substituent selected from H and C_1-C_8 alkyl;

R^3 is optionally branched C_1-C_{10} alkyl or optionally branched C_1-C_{10} alkenyl, wherein said alkyl or alkenyl are optionally substituted with hydroxyl, alkoxy, halo (fluoro, chloro, bromo, iodo), thio, amino or cyano; and

R^4 is optionally branched C_1-C_8 alkyl or optionally branched C_1-C_8 alkenyl, optionally substituted with hydroxyl, halo (fluoro, chloro, bromo, iodo) thio, amino and cyano; and

R^5 is optionally branched C_1-C_8 alkyl or optionally branched C_1-C_8 alkenyl.

4. The pharmaceutical composition of claim 1, wherein said cannabinoic quinone is a compound of formula (V):



(V)

wherein

X is an oxygen, nitrogen or sulfur atom;

p is zero when X is oxygen or sulfur, or p is 1 when X is nitrogen;

R^1 is H or C_1-C_8 alkyl;

R^2 designates a methylene group optionally substituted with up to two alkyl groups, wherein R^2 with the substituents comprises up to 5 carbon atoms;

R^3 is optionally branched C_1-C_{10} alkyl or optionally branched C_1-C_{10} alkenyl, wherein said alkyl or alkenyl are optionally substituted with hydroxyl, alkoxy, halo (fluoro, chloro, bromo, iodo), thio, amino or cyano; and

R^4 is optionally branched C_1-C_8 alkyl or optionally branched C_1-C_8 alkenyl, optionally substituted with hydroxyl, halo (fluoro, chloro, bromo, iodo) thio, amino and cyano.

5. The pharmaceutical composition of claim 3, wherein X is oxygen, R^2 is hydrogen, and R^3 is 2-propyl or 2-propenyl.

6. The pharmaceutical composition of claim 4, wherein X is an oxygen atom forming a pyrane ring comprising two carbon atoms of the quinone

ring to which said oxygen is attached and carbon atoms 3 and 4 of ring A, which pyrane ring is preferably 2,2-dimethyl substituted.

7. The pharmaceutical composition of claim 1, wherein R^3 is methyl.

8. The pharmaceutical composition of claim 1, wherein said cannabinoic quinone is the compound 3S,4R-p-benzoquinone-3-hydroxy-2-p-mentha-(1,8)-dien-3-yl-5-pentyl (also designated HU-331).

9. The pharmaceutical composition of claim 1, wherein said cannabinoic quinone is the compound 6aR,10aR-1-H-dibenzo[b,d]pyran-1,4-(6H)-dione-6aβ,7,10,10aα-tetrahydro-6,6,9-trimethyl-3-pentyl (also designated HU-336).

10. The pharmaceutical composition of claim 1, wherein said cannabinoic quinone is the compound 1-H-dibenzo[b,d]pyran-1,4(6H)-dione-6,6,9-trimethyl-3-pentyl (also designated HU-345).

11. The pharmaceutical composition of claim 1, wherein said cannabinoic quinone is the compound 3S,4R-p-benzoquinone-3-hydroxy-2-[p-mentha-1-en-3-yl]-5-pentyl (also designated HU-395).

12. The pharmaceutical composition of claim 1, wherein said cannabinoic quinone is the compound 3S,4R-p-benzoquinone-3-hydroxy-2-[p-menthan-3-yl]-5-pentyl (also designated HU-396).

13. The pharmaceutical composition of claim 1, for the treatment of hyperproliferative disorders.

14. The pharmaceutical composition of claim 13, wherein said hyperproliferative disorder is a malignant or a non-malignant disorder.

15. The pharmaceutical composition of claim 13, wherein said hyperproliferative disorder is one of carcinoma, lymphoma, melanoma, glioblastoma and sarcoma.

16. The pharmaceutical composition of claim 14, wherein said non-malignant hyperproliferative disorder is psoriasis.

17. The pharmaceutical composition of claim 1, for intra-peritoneal (i.p.), subcutaneous (s.c.) or intratumor administration.

18. The pharmaceutical composition of claim 1, for the treatment of a disease or condition selected from inflammation and infections caused by bacteria, protozoa or fungus.

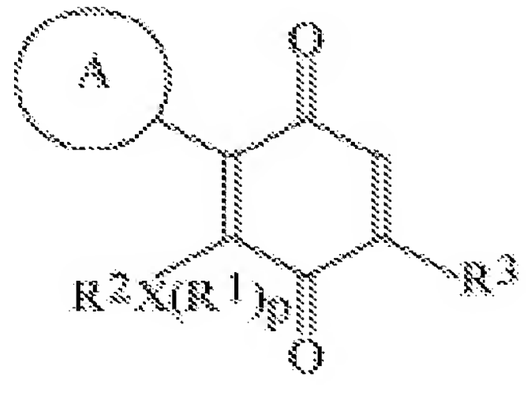
19. The pharmaceutical composition of claim 1, for the treatment of an autoimmune disease.

20. The pharmaceutical composition of claim 1, optionally further comprising pharmaceutically acceptable additives, diluents and carriers.

21. The pharmaceutical composition of claim 20, wherein said carrier is a 1:1:18 (v/v) mixture of ethanol:Emulphor®:PBS.

22. The pharmaceutical composition of claim 1, wherein said active agent comprises an optically active isomer or a racemic mixture of said cannabinoic quinone.

23. A method for the treatment of a hyperproliferative disorder, comprising administering to a subject in need of treatment a therapeutically effective amount of a cannabinoic quinone of formula I:



(I)

wherein,

ring A is 5-, 6-, or 7-membered alicyclic or aromatic ring optionally substituted with from 1 to 3 substituents selected independently from optionally branched C_1-C_8 alkyl, optionally branched C_1-C_8 alkenyl, hydroxy, alkoxy, halo (fluoro, chloro, bromo, iodo), thio, amino or cyano;

X is an oxygen, nitrogen or sulfur atom;

p is zero when X is oxygen or sulfur, or p is 1 when X is nitrogen;

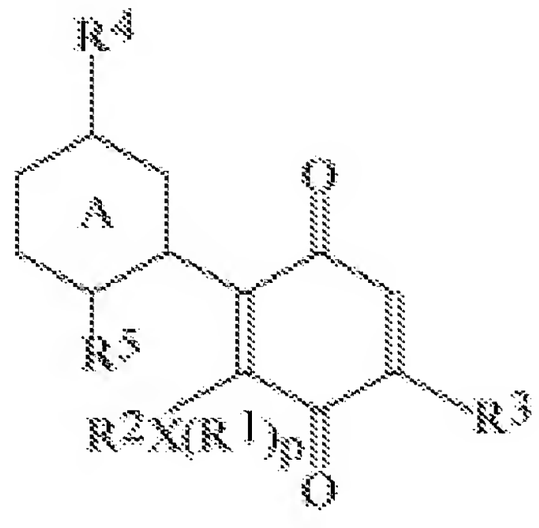
R^1 is H or C_1-C_8 alkyl;

R^2 designates a substituent selected from H and C_1-C_8 alkyl, or R^2 designates an optionally branched C_1-C_8 alkylene connected to ring A forming a 6-membered heterocyclic ring comprising atom X, two carbon atoms of the quinone ring to which X is attached and carbon atoms 3 and 4 of ring A; and

R^3 is optionally branched C_1-C_{16} alkyl or optionally branched C_1-C_{16} alkenyl, wherein said alkyl or alkenyl are optionally substituted with hydroxyl, alkoxy, halo (fluoro, chloro, bromo, iodo), thio, amino or cyano;

or of a pharmaceutical composition as defined in claim 1.

24. The method of claim 23, wherein said cannabinoic quinone is a compound of formula (II):



(II)

wherein,

ring A is a cyclohexane, cyclohexene or benzene ring;

X is an oxygen, nitrogen or sulfur atom;

p is zero when X is oxygen or sulfur, or p is 1 when X is nitrogen;

R^1 is H or C_1-C_8 alkyl;

R^2 designates a substituent selected from H and C_1-C_5 alkyl, or R^2 designates an optionally branched C_1-C_5 alkylene connected to ring A forming a 6-membered heterocyclic ring comprising atom X, two carbon atoms of the quinone ring to which X is attached and carbon atoms 3 and 4 of ring A;

R^3 is optionally branched C_1-C_{10} alkyl or optionally branched C_1-C_{10} alkenyl, wherein said alkyl or alkenyl are optionally substituted with hydroxyl, alkoxy, halo (fluoro, chloro, bromo, iodo), thio, amino or cyano;

R^4 is optionally branched C_1-C_8 alkyl or optionally branched C_1-C_8 alkenyl, optionally substituted with hydroxyl, halo (fluoro, chloro, bromo, iodo) thio, amino and cyano; and

R^5 is optionally branched C_1-C_8 alkyl or optionally branched C_1-C_8 alkenyl, or R^5 is hydrogen when R^2 is alkylene.

25. The method of claim 23, wherein said cannabinoic quinone is any one of HU-331, HU-336, HU-345, HU-395 and HU-396.

26. The method of treatment of claim 23, wherein said hyperproliferative disorder is a malignant or a non-malignant disorder.

27. The method of treatment of claim 23, wherein said hyperproliferative disorder is one of carcinoma, lymphoma, melanoma, glioblastoma and sarcoma.

28. The method of claim 27, wherein said cannabinoic quinone is one of HU-331, HU-395 and HU-396.

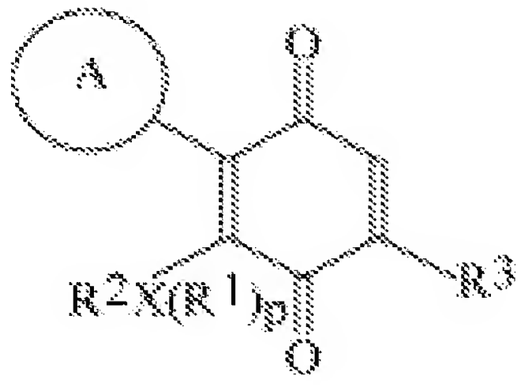
29. The method of claim 28, wherein said hyperproliferative disorder is one of colon cancer, lymphoma and breast cancer.

30. The method of claim 27, wherein said cannabinoic quinone is one of HU-336 and HU-345.

31. The method of claim 30, wherein said hyperproliferative disorder is one of prostate cancer and glioblastoma.

32. The method of claim 23, wherein said cannabinoic quinone or composition comprising the same is administered via intraperitoneal, subcutaneous or intratumor route.

33. A method for the treatment of one of inflammatory, infectious and autoimmune conditions, comprising administering to a subject in need of such treatment a therapeutically effective amount of a cannabinoic quinone of general formula I :



(I)

wherein,

ring A is 5-, 6-, or 7-membered alicyclic or aromatic ring optionally substituted with from 1 to 3 substituents independently selected from optionally branched C_1-C_5 alkyl, optionally branched C_1-C_5 alkenyl, hydroxy, alkoxy, halo (fluoro, chloro, bromo, iodo), thio, amino or cyano;

X is an oxygen, nitrogen or sulfur atom;

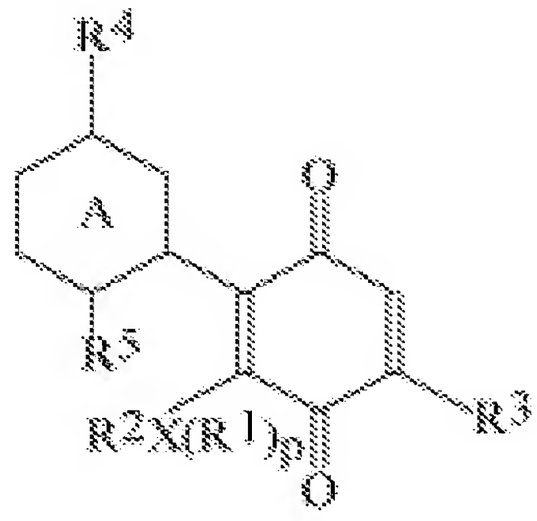
p is zero when X is oxygen or sulfur, or p is 1 when X is nitrogen;

R^1 is H or C_1-C_5 alkyl;

R^2 designates a substituent selected from H and C_1-C_5 alkyl, or R^2 designates an optionally branched C_1-C_5 alkylene connected to ring A forming a 6-membered heterocyclic ring comprising atom X, two carbon atoms of the quinone ring to which X is attached and carbon atoms 3 and 4 of ring A; and

R^3 is optionally branched C_1-C_{10} alkyl or optionally branched C_1-C_{10} alkenyl, wherein said alkyl or alkenyl are optionally substituted with hydroxyl, alkoxy, halo (fluoro, chloro, bromo, iodo), thio, amino or cyano; or of a pharmaceutical composition as defined in claim 1 .

34. The method of claim 33, wherein said cannabinoic quinone is a compound of formula (II):



(II)

wherein

ring A is a cyclohexane, cyclohexene or benzene ring;

X is an oxygen, nitrogen or sulfur atom;

p is zero when X is oxygen or sulfur, or p is 1 when X is nitrogen;

R^1 is H or C_1-C_8 alkyl;

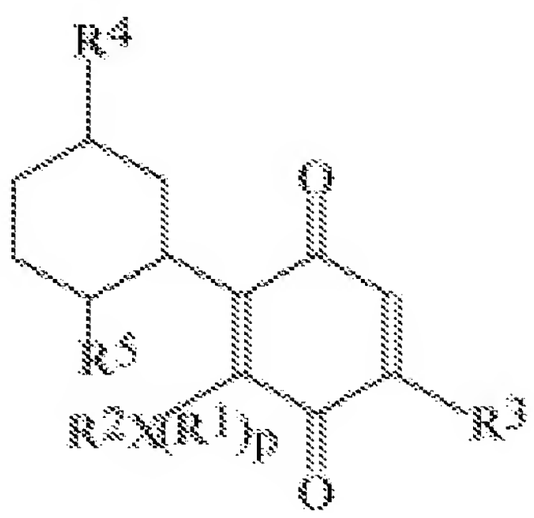
R^2 designates a substituent selected from H and C_1-C_8 alkyl, or R^2 designates an optionally branched C_1-C_8 alkylene connected to ring A forming a 6-membered heterocyclic ring comprising atom X, two carbon atoms of the quinone ring to which X is attached and carbon atoms 3 and 4 of ring A;

R^3 is optionally branched C_1-C_{10} alkyl or optionally branched C_1-C_{10} alkenyl, wherein said alkyl or alkenyl are optionally substituted with hydroxyl, alkoxy, halo (fluoro, chloro, bromo, iodo), thio, amino or cyano;

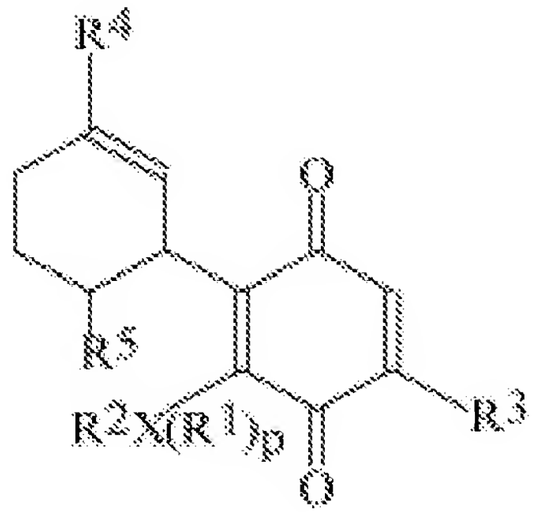
R^4 is optionally branched C_1-C_8 alkyl or optionally branched C_1-C_8 alkenyl, optionally substituted with hydroxyl, halo (fluoro, chloro, bromo, iodo) thio, amino and cyano; and

R^5 is optionally branched C_1-C_8 alkyl or optionally branched C_1-C_8 alkenyl, or R^5 is hydrogen when R^2 is alkylene.

35. A compound of formula (III) or (IV):



(III)



(IV)

wherein

X is an oxygen, nitrogen or sulfur atom;

p is zero when X is oxygen or sulfur, or p is 1 when X is nitrogen;

R^1 is H or C_1-C_8 alkyl;

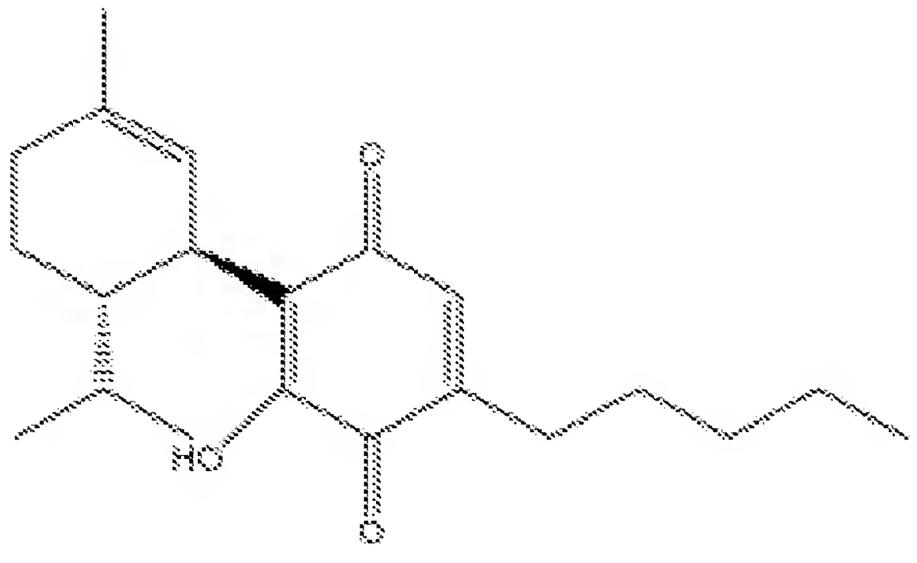
R^2 designates a substituent selected from H and C_1-C_8 alkyl;

R^3 is optionally branched C_3-C_{18} alkyl or optionally branched C_3-C_{18} alkenyl, wherein said alkyl or alkenyl are optionally substituted with hydroxyl, alkoxy, halo (fluoro, chloro, bromo, iodo), thio, amino or cyano; and

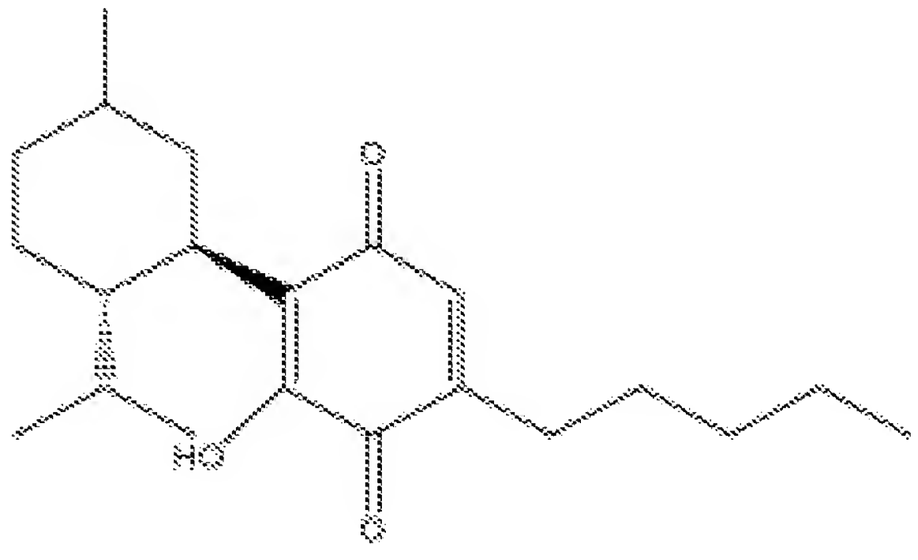
R^4 is optionally branched C_1-C_8 alkyl or optionally branched C_1-C_8 alkenyl, optionally substituted with hydroxyl, halo (fluoro, chloro, bromo, iodo) thio, amino and cyano; and

R^5 is optionally branched C_1-C_8 alkyl or optionally branched C_1-C_8 alkenyl.

36. The compound of claim 35, wherein said compound has one of the formulae:

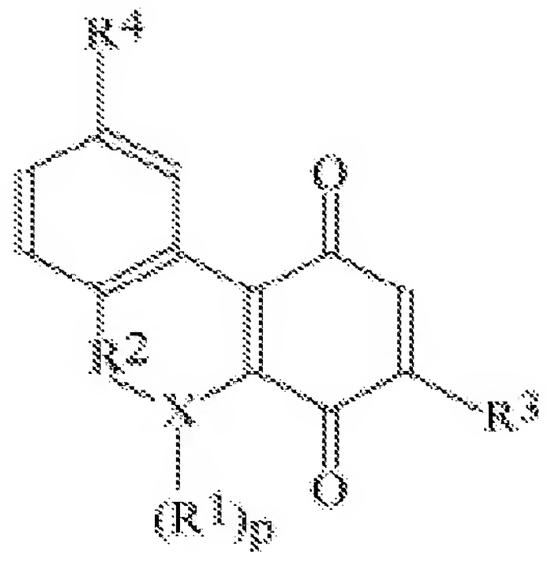


designated HU-395; or



designated HU-396.

37. A compound of formula (V):



(V)

wherein

X is an oxygen, nitrogen or sulfur atom;

p is zero when X is oxygen or sulfur, or p is 1 when X is nitrogen;

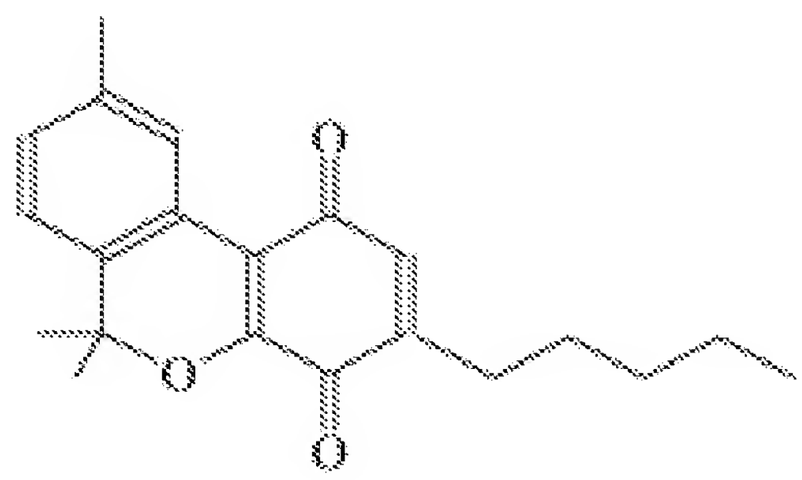
R^1 is H or C_1-C_8 alkyl;

R^2 designates a methylene group optionally substituted with up to two alkyl groups, wherein R^2 with the substituents comprises up to 5 carbon atoms;

R^3 is optionally branched C_1-C_{10} alkyl or optionally branched C_3-C_{10} alkenyl, wherein said alkyl or alkenyl are optionally substituted with hydroxyl, alkoxy, halo (fluoro, chloro, bromo, iodo), thio, amino or cyano; and

R^4 is optionally branched C_1-C_8 alkyl or optionally branched C_1-C_8 alkenyl, optionally substituted with hydroxyl, halo (fluoro, chloro, bromo, iodo) thio, amino and cyano.

38. The compound of claim 37, wherein said compound has the formula:



and is designated HU-345.

39. The optically active isomer and the racemic mixture of the compound defined in claim 36.

40. The optically active isomer and the racemic mixture of the compound defined in claim 37.

41. The optically active isomer and the racemic mixture of the compound defined in claim 38.